

What is claimed is:

1. A charged particle generating apparatus comprising:

a charged particle generating electrode including a  
5 raw-material passage formed therethrough, the raw-material  
passage extending from a base end to a free end of the charged  
particle generating electrode;

a raw-material supply section connected to the base end  
and supplying a raw material to the raw-material passage of the  
10 charged particle generating electrode; and

a charged particle extract electrode which generates an  
electric field between the charged particle extract electrode  
and the free end of the charged particle generating electrode.

15 2. The charged particle generating apparatus according to  
claim 1,

wherein an ion is emitted from the raw material at the  
free end of the charged particle generating electrode by  
generating the electric field in which the charged particle  
20 generating electrode is positive and the charged particle  
extract electrode is negative.

3. The charged particle generating apparatus according to  
claim 1,

25 wherein an electron is emitted from the raw material at  
the free end of the charged particle generating electrode by  
generating the electric field in which the charged particle

generating electrode is negative and the charged particle extract electrode is positive.

4. The charged particle generating apparatus according to claim 1,

wherein one of an ion and an electron is selectively emitted from the raw material at the free end of the charged particle generating electrode by selectively generating a first electric field in which the charged particle generating electrode is positive and the charged particle extract electrode is negative and a second electric field in which the charged particle generating electrode is negative and the charged particle extract electrode is positive.

5. The charged particle generating apparatus according to claim 3,

wherein when electron is emitted from the raw material, the raw-material supply section supplies the raw material having a work function lower than a work function of the charged particle generating electrode material.

6. The charged particle generating apparatus according to claim 1, further comprising a temperature controlling section which controls the temperature of the charged particle generating electrode.

7. The charged particle generating apparatus according to

claim 1,

wherein the charged particle generating electrode has a tubular structure.

5 8. The charged particle generating apparatus according to claim 7,

wherein the charged particle generating electrode has a multiwall tubular structure.

10 9. The charged particle generating apparatus according to claim 1,

wherein the charged particle generating electrode is formed by a carbon tube.

15 10. A charged particle generating apparatus comprising:  
a charged particle generating electrode including a raw-material passage formed therethrough, the raw-material passage extending from a base end to a free end of the charged particle generating electrode;

20 a raw-material supply section connected to the base end and supplying a raw material to the raw-material passage of the charged particle generating electrode;

a charged particle extract electrode which generates an electric field between the charged particle extract electrode  
25 and the free end of the charged particle generating electrode;

an electric-field-forming power supply section which generates a first electric field, in which the charged particle

generating electrode is positive and the charged particle  
extract electrode is negative, in an ion generation mode, and  
generates a second electric field, in which the charged particle  
generating electrode is negative and the charged particle  
5 extract electrode is positive, in an electron generation mode;  
and

a raw-material supply stopping section which stops the  
supply of raw material from the raw-material supply section in  
the electron generation mode.

10 11. The charged particle generating apparatus according to  
claim 10, further comprising a temperature controlling section  
which controls the temperature of the charged particle  
generating electrode.

15 12. The charged particle generating apparatus according to  
claim 10,

wherein the charged particle generating electrode has a  
tubular structure.

20 13. The charged particle generating apparatus according to  
claim 12,

wherein the charged particle generating electrode has a  
multiwall tubular structure.

25 14. The charged particle generating apparatus according to  
claim 10,

wherein the charged particle generating electrode is formed by a carbon tube.

15. A charged particle generating method comprising the steps  
5 of:

supplying a raw material to a tip end of a charged particle generating electrode through a raw-material passage formed in the charged particle generating electrode; and

generating an electric field between the charged particle  
10 generating electrode and a charged particle extract electrode and generating charged particles from the raw material at the tip end of the charged particle generating electrode.

16. The charged particle generating method according to claim  
15,

wherein an ion is emitted from the raw material at the tip end of the charged particle generating electrode by generating the electric field in which the charged particle generating electrode is positive and the charged particle  
20 extract electrode is negative.

17. The charged particle generating method according to claim  
15,

wherein electron is emitted from the raw material at the  
25 tip end of the charged particle generating electrode by generating the electric field in which the charged particle generating electrode is negative and the charged particle

extract electrode is positive.

18. The charged particle generating method according to claim 15,

5 wherein one of an ion and an electron is selectively emitted from the raw material at the tip end of the charged particle generating electrode by selectively generating a first electric field in which the charged particle generating electrode is positive and the charged particle extract  
10 electrode is negative and a second electric field in which the charged particle generating electrode is negative and the charged particle extract electrode is positive.

19. The charged particle generating method according to claim 15 17,

wherein when electron is emitted from the raw material, the raw-material supply section supplies the raw material having a work function lower than a work function of the charged particle generating electrode material.

20. A charged particle generating method in which mode is changeable between an ion generation mode and an electron generation mode, the method comprising the steps of:

in the ion generation mode,

25 supplying a raw material to a tip end of a charged particle generating electrode through a raw-material passage formed in the charged particle generating electrode; and

generating a first electric field in which the charged particle generating electrode is positive and the charged particle extract electrode is negative to emit an ion from the raw material at the tip end of the charged particle generating electrode,

in the electron generation mode,

stopping supplying the raw material from the raw-material supply section; and

generating a second electric field in which the charged particle generating electrode is negative and the charged particle extract electrode is positive to emit an electron from the raw material at the tip end of the charged particle generating electrode.

21. The charged particle generating method according to claim 20, further comprising a step of controlling the temperature of the charged particle generating electrode in at least one of the ion generation mode and the electron generation mode.